

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
6 May 2004 (06.05.2004)

PCT

(10) International Publication Number
WO 2004/037113 A1

(51) International Patent Classification⁷: **A61C 15/00**

(21) International Application Number:
PCT/IB2003/003452

(22) International Filing Date: 23 July 2003 (23.07.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2002-312191 28 October 2002 (28.10.2002) JP
2002-382623 27 December 2002 (27.12.2002) JP

CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(71) Applicant and

(72) Inventor: **TAKAHASHI, Atsushi** [JP/JP]; 20-15-1 Kizaki, Tsuruga, Fukui 914-0814 (JP).

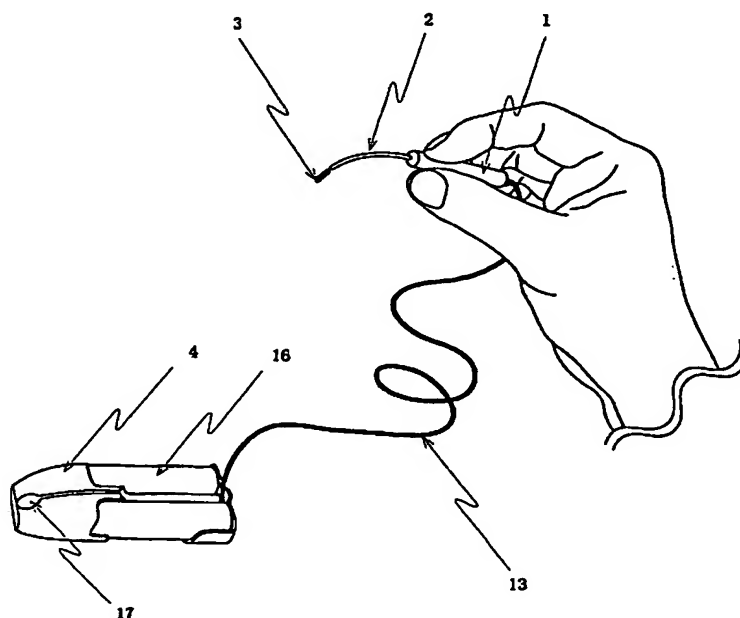
Published:

— with international search report

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: **ELECTRIC INTERDENTAL BRUSH**



(57) Abstract: Disclosed is an electric inter-dental brush device which is generally divided into a cleaning brush attached at a head assembly of the electric inter-dental brush device, a finger grip of a small size for holding a small-sized motor for driving the cleaning brush and a housing for holding a battery or AC adaptor for the small-sized motor and other components and parts of the electric inter-dental brush device. The finger grip and the housing are physically separated except through an electric cord connecting the small-sized motor and the battery or AC adaptor.

SPECIFICATION

5

TITLE OF THE INVENTION**ELECTRIC INTER-DENTAL BRUSH**10 **DESCRIPTION OF THE PRIOR ART**

This invention relates to an electric toothbrush, and more particularly an electric inter-dental brush of a finger grip type having a freely detachable brush at its tip end.

In general, an electrical toothbrush having a motor providing power or drive and battery or an AC adapter was self contained, and compared to a conventional toothbrush, it
15 was heavier and bulkier.

Due to the larger shape or bulkiness and heavier weight of the electrical toothbrush when compared to a conventional toothbrush, the usage sensation felt by the user was different from the conventional hand help/propelled toothbrush. This made it more difficult to utilize the existing finger-based brushing techniques. When the user relied
20 more on the power generated by the movement of the brush, it was possible to lower the amount of plaque removable on a section by section basis. Especially with inter-dental space brush, the awkwardness associated with the weight and bulkiness made it more

difficult to properly perform the brushing without a soft/tender touch so the user did not damage the gum. Also it is desirable to have the equipment waterproofed for daily usage.

SUMMARY OF THE INVENTION

5 Accordingly, it is an object of the present invention to provide an electric toothbrush of a finger grip type suitable for inter-dental brushing techniques.

It is another object of the present invention to provide an electric toothbrush of a finger grip type having a detachable and light-weight cleaning brush at its tip end for allowing the user to utilize the existing finger-relied inter-dental brushing techniques.

10 It is still another object of the present invention to provide an electric inter-dental brush device of a finger grip type including a finger grip for containing a source of drive therein and a detachable cleaning brush powered by the source of drive.

It is still another object of the present invention to provide an electric inter-dental brush device of a finger grip and rewinding type including a finger grip for holding a source
15 of drive and a detachable cleaning brush powered by the source of drive and a rewindable electrical connection cord or wire connected between the source of drive and the cleaning brush.

In a preferred embodiment of the present invention, an electric inter-dental brush device utilizes a small-sized motor or ultrasonic vibrator as a source of drive to be housed
20 in a finger grip of a small-sized cylindrical shape for powering a cleaning brush to be secured at a tip end of the electric inter-dental brush device. An output section of the electric inter-dental brush device is designed to provide an appropriate amount or form of

output drive to the cleaning brush by increasing or decreasing the output of rotating power, or by converting the output power into rotating movement, repeating movement, sliding movement, or a combination of two or more of these movements.

If the ultrasonic vibrator is used instead of the small-sized motor, an output section
5 of the ultrasonic vibrator is housed inside the finger grip. The driving power generated from the output section is transferred through a cleaning brush shaft which at one end away from the output section is the cleaning brush. The shaft penetrates through a head assembly of the electric inter-dental brush device. The head assembly is connected to the finger grip of the electric inter-dental brush device through a coupling section which allows
10 the head assembly to be removable from the finger grip. When the user uses the electric inter-dental brush device for oral cavity cleaning, the finger grip thereof can easily be held by fingers and provide maneuverability and usage sensation equivalent to a conventional (non-electric) toothbrush or an inter-dental space brush.

Electricity to run the small-sized motor or ultrasonic vibrator is provided from a
15 battery or batteries or from an AC converter adapter which is housed in a casing or housing of the electric inter-dental brush device. Electrical cords or wires to provide electricity to the motor or to the ultrasonic vibrator are to be adjusted at an appropriate length. A waterproofed spool assembly is housed within the housing to rewind the electrical cords or wires, contain components or parts for an electrical power supply. This arrangement is
20 effective in increasing the portability of the electric inter-dental brush device. A space in the housing for the wound cord is enclosed. A cover is designed to cover up and enclose

the space for the wound cord, the housing of the electric inter-dental brush device. The head assembly and the cover may be put on or removed directly to and from the housing.

BRIEF DESCRIPTION OF THE DRAWINGS

5 Other objects and features of the present invention will become apparent from the following detailed description considered in connection with the accompanying drawings which discloses the embodiments of the present invention. It should be understood, however, that the drawings are designed for the purposes of illustration only and not as a definition of the limits of the invention.

10 In the drawings, wherein similar reference characters denote similar elements throughout the several views:

FIG. 1 is a perspective view showing the condition where an electric inter-dental brush device according to the present invention is in use;

15 FIG. 2 is a cross sectional side view of the electric inter-dental brush device as shown in FIG. 1;

FIG. 3 is a cross sectional plain view of a housing of the electric inter-dental brush device as shown in FIG. 1;

FIG. 4 is an exploded perspective view of the housing as shown in FIG. 3;

20 FIG. 5 is a perspective view of the electric inter-dental brush device with a suction cup according to another embodiment of the present invention;

FIG. 6 is a partially cut-away view of the electric inter-dental brush device as shown in FIG. 5;

FIG. 7 is a perspective view of the electric inter-dental brush device according to another embodiment of the present invention;

FIG. 8 is a perspective view of the electric inter-dental brush device according to still another embodiment of the present invention;

5 FIGS 9(A) to 9(C) are exploded views of a head assembly in the electric inter-dental brush device according to the present invention;

FIGS. 10(A) to 10(H) are front, side and cross-sectional views of individual components of the head assembly;

10 FIGS. 11(A) and 11(B) are enlarged assembled and cross-sectional views of the head assembly;

FIGS. 12(A) to 12(F) are schematic diagrams showing operation of safety switches; and

FIGS. 13(A) to 13(G) are views showing operation of another example of safety switches.

15

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Turning now in detail to the drawings, the figures shows an electric inter-dental brush device according to several embodiments of the present invention.

20 FIGS. 1, 6, and 8 illustrates the electric inter-dental brush device according to three embodiments of the present invention. The electric inter-dental brush device as illustrated therein is generally divided into a cleaning brush 3 attached at a head assembly of the electric inter-dental brush device, a finger grip 1 of a small size for holding a source of

drive for driving the cleaning brush 3 and a housing 4 for holding a power supply for the drive source and other components and parts of the electric inter-dental brush device. As illustrated in FIG. 1, a small-sized motor 5 (FIG. 2) or an ultrasonic vibrator 24 (as in FIG. 8) is provided as source of electric drive for powering the cleaning brush 3.

5 An output section (gear box) 6 of the motor 5 is self contained in the finger grip 1 to transfer the output from such driving device to the detachable brush head assembly 2, which contains the cleaning brush 3 located at the tip of the head assembly 2. The head assembly 2 containing the cleaning brush 3 is detachable from the finger grip 1 for replacements of the cleaning brush 3. An electric supply 16 (a battery or batteries in FIG. 10 3) supplying electric power to the small-sized motor is physically separated from the finger grip 1 except via an electric cord 13 connecting the small-sized motor 5 and the electric supply 16. The electric supply 16 is contained within the housing 4. The housing 4 contains an electrical cord rewinding device, wherein the electrical cord 13 is stored. All components or parts of the electric supply 16 are also contained in the housing 4 to improve 15 portability and shape. The housing 4 has a space or recess for receiving the finger grip 1 and another space or recess for the head assembly 2.

While FIG. 9(A) shows the small-sized motor 5 of a diameter of 5.4 mm, for example, FIG. 9(B) shows in more detail the finger grip 1 and the head assembly 2 and FIG. 9(C) shows a cross sectional view of the head assembly 2. As more clearly illustrated in 20 FIGS. 10(A) to 10(H), the head assembly 2 includes an up-down movement shaft 51 to which the cleaning brush 3 is attached. The up-down movement shaft 51 is also coupled with the small-sized motor 5 for rotational movement so that the shaft 51 carries out not

only up-down movement but also rotational movement. The output section (gear box) located between the up-down movement shaft 51 and the small-sized motor 5 includes a carrier output shaft 52, a carrier 53, a desired number of planet gears 54, a sun gear 55 at the center of the planet gears 54, and an inner gear 56. The gear box comprising those
5 gears is secured between an output shaft set cover 57 and a motor bracket 58. The output box 6 when assembled is illustrated in more detail in FIGS. 11(A) and 11(B).

If the number of the planet gears 54 is changed, then the number of revolutions and revolution torque of the gear box are made adjustable. When the number of planet gears 54 is three, for example, reduction of revolution speed will be 1/20. Should the gear box
10 be of a cartridge type, an electric inter-dental brush may be made adjustable for different rates of revolutions, even with the same voltage and same motor. As long as the user purchases an electric inter-dental brush, he or she may use or adjust that one for his or her best brushing position and brushing technique.

The driving mechanism for up-down movement and rotation is also shown and
15 described in PCT application PCT/JP02/04510 "UNIVERSAL ANGLE ELECTRIC ORAL CLEANING DEVICE", filed on May 9, 2002 by the same applicant, the disclosure of which is incorporated by reference.

As shown in FIG. 1, the electric supply 16 is physically separated, making the whole of the electric inter-dental brush device light in weight and compact, and provides
20 maneuverability and usage sensation similar to the popular hand held inter-dental brush. The established finger-based brushing technique for manual (non-electric) brushes may be

used with the present invention, particularly because the finger grip 1 for housing the drive device is light in weight and may be held by fingers.

As shown in FIG. 2, the head assembly 2 having the cleaning brush 3 at its tip end is flexible and has a rotational phase relative to the finger grip 1. The rotational phase of the head assembly 2 may be set at several different pre-set angles or a removable joint 8 between the finger grip 1 and the head assembly 2 itself may be adjustable at an appropriate angle desired by the user. Therefore, in addition the head assembly 2 having the cleaning brush 3 is also detachable, allowing the angle between the cleaning brush and the finger grip 1 may be adjusted according to the desired area of cleaning.

Within the finger grip 1, there are located the small-sized motor 5, and the power output device (gear box) 6. In the embodiment of FIG. 8, the ultrasonic vibrator 24 is located within the finger grip 1. Drive force from the shaft 7 is transferred to the joint 8, and a cam mechanism 9 to convert the rotating movement into one or combination of rotating movement, repeating movement, sliding movement or repeating movement. The resulting movement is finally transferred to the cleaning brush through a slider 10 which penetrates through the head assembly 2 of the electric inter-dental brush device.

A water resistant packing 11 is attached to the other end of the finger grip 1, and an electric cord or wire 13 is pulled into the finger grip 1 and attached to an input terminal 12 of the motor through this water resistant packing 11.

This electric cord 13, as illustrated in FIG. 3, is stored in an electric cord rewinding assembly 15, with a water repelling packing 14 in the housing as a guide for the electric cord. The electric cord rewinding assembly 15 adjusts the length of the electric cord 13 to

an appropriate length and a terminal secured at the back side of the electric cord rewinding assembly 15 is used for attachment to the battery or batteries (electrical power supply or power source) 16.

When the electric inter-dental brush device is used as a portable device, as shown in FIG. 5, the finger grip 1 and the head assembly 2 having the cleaning brush 3 are held in spaces or recesses in the housing 17, while the electric cord 13 is wound in the electric cord rewinding assembly 15. A housing cover 18 is attached as protection to prevent the finger grip 1, the head assembly 2 and the cleaning brush 3 from contamination.

FIGS. 12(A) to 12(F) show another example of the housing 4 with a safety switch mechanism wherein the housing 4 is shaped like a breakable egg with a left half 4' and a right half 4'' with a couple of switches 30 and 31. The switches 30 and 31 are connected in series between the motor 5 and the power supply or batteries 16 for safety purposes. The first switch 31 is turned OFF only when pushed by the head assembly 2, whereas the second switch 32 is OFF when the housing 4 is open and ON when the housing 13 is closed. That is, power is supplied to the motor 5 only when the housing 4 is closed and the head assembly 2 is pulled out from the housing 4.

When the housing 4 is held by the user and one click opened by the left hand, for example, the housing 4 is opened so that the head assembly 2 may be pulled out of the housing 4 by the right hand. Once the housing 4 is then one click closed, the head assembly 2 starts operating. When the housing 4 is gripped again after use, the housing 4 is opened to turn OFF the second switch 32. Therefore, safety is secured against misuse

because the head assembly 2 operates only when the housing 4 is closed and the head assembly 2 is pulled out of the housing 4.

It is noted that as shown in FIGS. 13(D) to 13(F) the head assembly 2 is positioned with stability because the bottom of the housing 4 is curved in a certain direction. Even
5 when the electric cord 13 is rewound into the rewinding assembly 15, the head assembly 2 will keep stable and will not turn in a certain direction.

The shape of the housing 4 shown in FIGS. 5 and 6 may be designed to be permanently attached to improve portability. When this shape and design is used, an AC adapter 19 and the electric cord rewinding assembly 15, which can adjust the length of the
10 unwound electrical cord to an appropriate length, are both housed inside the housing 4. A suction cup 20 is attached on the back side of the housing 4. For example, the housing 4 may be attached to a surface of bathroom sink or a mirror surface. An AC adapter cord 21 is connected to a household AC electric outlet as shown in FIG. 6. The electric cord 13 is wound up by the electrical cord rewinding assembly 15, while the finger grip 1 remains
15 fitted closely to the housing 4.

The housing 4 is held by the suction cup 20 to the mirror or other surfaces, as shown in FIG. 6. Under this condition, the finger grip 1 may be pulled out with the cord extending to an appropriate length and a rotation switch mechanism 28 secured on the electrical cord rewinding assembly 15 is automatically activated, so that the user can
20 immediately start the process to clean the oral cavity. The cleaning brush 3 is kept dry when not in use, to prevent growth of caries and other bacteria, the causes of gum diseases which are bacteria that do not like dry or airy environment. An electric cord rewinding

wheel 22 is located at the bottom of the housing 4 for winding and holding an AC adapter cord 21. This arrangement makes the electric inter-dental brush device compact and makes the same not bulky and easy to change location of where the electric inter-dental brush device is set up.

5 Where the ultrasonic vibrator 24 is used as the source of driving the cleaning brush 3, its electric power supply may still be separated as shown in FIG. 7. Therefore the outer shape of the electric inter-dental brush device as shown in FIG. 7 may be similar to the outer shape of a conventional hand-held inter-dental(non-electric) brush. The shape of the housing 4 is shaped to fit the finger grip 1 and a head arm 26. The electric cord 13 is
10 wound and stored in the electrical cord winding wheel 22 and the cleaning brush 3 is held in a storage space in the housing 4.

 As the ultrasonic vibrator 24 may be applicable to inter-dental brush, as shown in FIG. 8, the housing 4 may be divided into a first division for the AC adapter 19 with an electric cord and a second division for the electric cord rewinding mechanism 15. The
15 housing 4 may be made highly portable by making the first and second divisions of the housing 4 detachable. When the device is in use, the first and second divisions of the housing 4 are separated and the AC adapter cord 21 and the power supply electric cord 13 are pulled out from the electric cord rewinding mechanism 15. The AC adapter 19 is plugged into an electric utility outlet and the electrical cord rewinding mechanism 15 is
20 affixed to a mirror or other surface by a suction cup or other means. Because the AC adapter which is relatively heavy is secured on the mirror or other surface, the negative effect towards the brushing technique is avoided. When the electrical cord rewinding

mechanism 15 is maintained at the same height as the height of the oral cavity, the weight of the electric cord 13 is also reduced by half, allowing the user to practice intricate brushing technique.

When a brush holding mechanism is formed or installed on the housing 4, the
5 cleaning brush 3 may be kept dry as shown in FIG. 5 to prevent the growth of caries and bacteria that cause periodontal disease, which do not prefer dry and ventilated area for growth. As shown in FIG. 8, the AC adapter cord 21 and the electric cord 13 are stored in the electric cord rewinding device 15. The AC adapter 19 and the electric cord rewinding device 15 is combined into as one unit with the aid of a joint mechanism 23. In the
10 embodiment of FIG. 7 wherein the battery or batteries (electrical power supply) 16 is kept within the housing 4, the electrical cord 13 is wound onto the perimeter of the winding wheel 22. The portability of the electric inter-dental brush device is increased by installing a brush holding mechanism (not shown) on the housing 4.

The shape of the cleaning brush 3 of the electric inter-dental brush device with the
15 rewinding cord according to the embodiments of the present invention is not to be limited to the illustrations and suggestions described above. It should be noted that the finger grip 1, the battery or batteries (electric power supply) 16, the AC adapter 19 and the electrical cord rewinding assembly 15 may be combined in other ways as well as certain changes and improvements may be made, so long as it is within the spirit and scope of the present
20 invention.

According to the illustrated embodiments of the present invention, the portion of the electric inter-dental portable electrical brush with the rewinding cord, to be held by the

hand of the user is small and light weight. More particularly, the finger grip may be similar in shape and size to a conventional hand-held inter-dental brush to allow the user the maneuverability and usage sensation that is equal to the conventional hand-held inter-dental brush and allow the user to practice the established brushing technique. In addition,
5 the housing 4 may be equipped with a water repelling packing or gasket for daily use.

While only a few embodiments of the present invention have been shown and described, it is to be understood that many changes and modifications may be made thereunto without departing from the spirit and scope of the invention as defined in the appended claims.

WHAT IS CLAIMED IS:

1. An electric inter-dental brush device comprising:

a finger grip for containing a source of drive therein;

5 a housing for holding a power supply to the drive source in the finger grip, the housing being separate from the finger grip; and

a cleaning brush secured at a tip portion of the electric inter-dental brush device, the cleaning brush being powered by the source of drive.

10 2. An electric inter-dental brush device comprising:

a finger grip for containing a source of drive therein;

a housing for holding a power supply to the source of drive in the finger grip, the housing being separate from the finger grip;

a cleaning brush secured at a tip portion of the electric inter-dental brush device,

15 and

a connection member for connecting between the source of drive and the power supply for powering the cleaning brush.

3. The electric inter-dental brush device of Claim 1 wherein the source of drive

20 comprises a small-sized motor for driving the cleaning brush.

4. The electric inter-dental brush device of Claim 1 wherein the cleaning brush is freely removable from the finger grip.

5. An electric inter-dental brush device comprising:

- 5 a finger grip for containing a small-sized motor;
a housing for holding a battery to the small-sized motor in the finger grip, the housing being separate from the finger grip;
a cleaning brush secured at a tip portion of the electric inter-dental brush device,
an electric cord for connecting between the small-sized motor and the power supply
10 for powering the cleaning brush; and
an electric cord rewinding assembly for holding and rewinding the electric cord.

6. An electric inter-dental brush device comprising:

- 15 a finger grip for containing a small-sized motor;
a housing for holding an AC adaptor to the small-sized motor in the finger grip, the housing being separate from the finger grip, the AC adaptor being plugged in a household utility outlet;
a cleaning brush secured at a tip portion of the electric inter-dental brush device,
an electric cord for connecting between the small-sized motor and the AC adaptor
20 for powering the cleaning brush; and
an electric cord rewinding assembly for holding and rewinding the electric cord
the cleaning the cleaning brush being powered by the AC adaptor.

7. The electric inter-dental brush device of Claim 1 further comprising:

a suction cup for attaching the housing to a mirror or other surface of a building or structure.

5

8. The electric inter-dental brush device of Claim 1 further comprising a space in the housing for holding the cleaning brush when the brush is not in use.

9. An electric inter-dental brush device comprising:

10 a finger grip to be held by fingers of a user of the electric inter-dental brush device;
a motor contained within the finger grip;
an output section associated with the motor for providing drive force from the motor;

a head assembly holding a cleaning brush at its tip end and a brush arm connecting
15 between the output section and the cleaning brush, the head assembly being connected to the output section to convey the drive force to the cleaning brush;

a housing for holding components and parts of a power supply to the motor, the finger grip being separate from the finger grip;

an electric cord for connecting the power supply to the motor; and

20 an electric cord rewinding assembly secured in the housing for holding and rewinding the electric cord when the electric inter-dental brush device is not in use.

10. An electric inter-dental brush device comprising:

a finger grip to be held by fingers of a user of the electric inter-dental brush device;

a motor contained within the finger grip;

an output section associated with the motor for providing drive force from the

5 motor;

a head assembly holding a cleaning brush at its tip end and a brush arm connecting between the output section and the cleaning brush, the head assembly being connected to the output section to convey the drive force to the cleaning brush;

a housing for holding components and parts of a power supply to the motor, the

10 finger grip being separate from the finger grip;

an electric cord for connecting the power supply to the motor;

an electric cord rewinding assembly secured in the housing for holding and rewinding the electric cord when the electric inter-dental brush device is not in use;

a space in the housing for holding the cleaning brush and keeping the same dry

15 when the electric inter-dental brush device is not in use; and

a cover for protecting the space and the housing from outside.

11. An electric inter-dental brush device comprising:

a finger grip to be held by fingers of a user of the electric inter-dental brush device;

20 a head assembly connected to the finger grip, the head assembly comprising a head arm and a cleaning brush connected to the head arm;

an ultrasonic vibrator secured within the finger grip for vibrating the cleaning brush;

a power supply for powering the ultrasonic vibrator;
an electric cord for connecting the power supply to the ultrasonic vibrator;
a electric rewinding assembly for rewinding the electrical cord with capability of
adjusting the length of the cord;

5 a housing for enclosing the power supply, the housing being separate from the
finger grip;

a storage space formed into the housing; and

a detachable cover for enclosing the finger grip and the head arm as protection
against outside.

10

12. The electrical inter-dental brush of Claim 11, wherein the housing is shaped to
match the shape of the cleaning brush, including the head arm, and made detachable into
separate pieces and also to be used as one piece.

15

13. The electrical inter-dental brush device of Claim 11, wherein the head arm is
made from resin material, the resin material being permanently reshaped by pressure from
fingers and the rotational angle of the head arm being selectable or adjustable.

20

14. The electrical inter-dental brush device of Claim 11, wherein the cover is made
from water repelling resin with a hole in the center of the cover for holding the electric cord
and with slits made in a radiating pattern from the hole, acting like a shield packing.

15. The electrical inter-dental brush device of Claim 11, wherein the electric cord rewinding assembly has a waterproofed outer cover and a portion of the electric cord rewinding assembly within the housing is made detachable, while keeping electric connection between the power supply and the ultrasonic vibrator.

5

16. The electrical inter-dental brush device of Claim 11 further comprising a suction cup attached to a back side of the electric inter-dental brush device.

17. The electrical inter-dental brush device of Claim 11, further comprising a switch
10 for turning on the ultrasonic vibrator when the electric cord is pulled out of the electric cord rewinding assembly to an appropriate length, .

18. An electric inter-dental brush device comprising:

a finger grip for containing a source of drive therein;

15 a housing for holding a power supply to the drive source in the finger grip, the housing being separate from the finger grip and freely opened or closed;

a cleaning brush secured at a tip portion of the electric inter-dental brush device, the cleaning brush being powered by the source of drive; and

a switch mechanism for allowing power supply to the cleaning brush only when the
20 housing is closed and the cleaning brush is out of the housing.

19. The electric inter-dental brush device of Claim 9 wherein the output section includes a plurality of planer gears for reducing the revolution speed of the motor.

FIG. 1

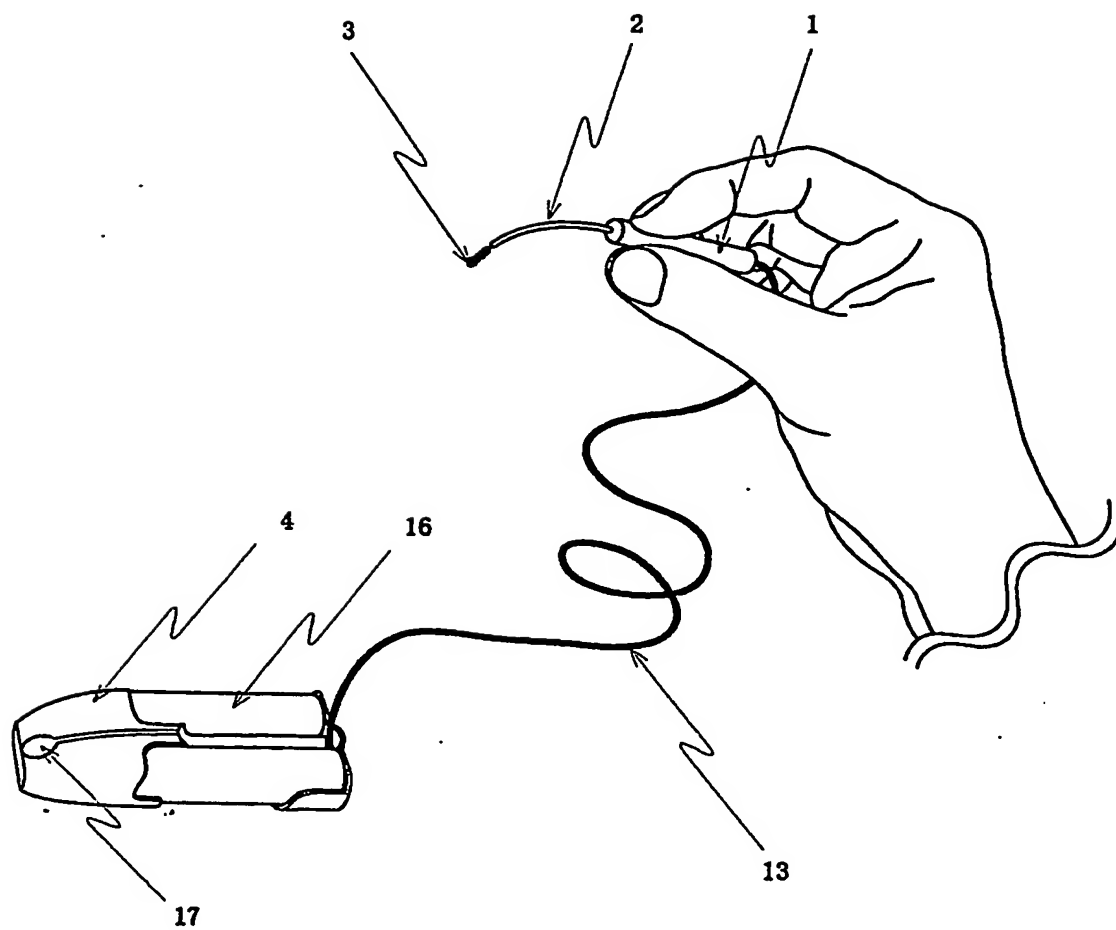


FIG. 2

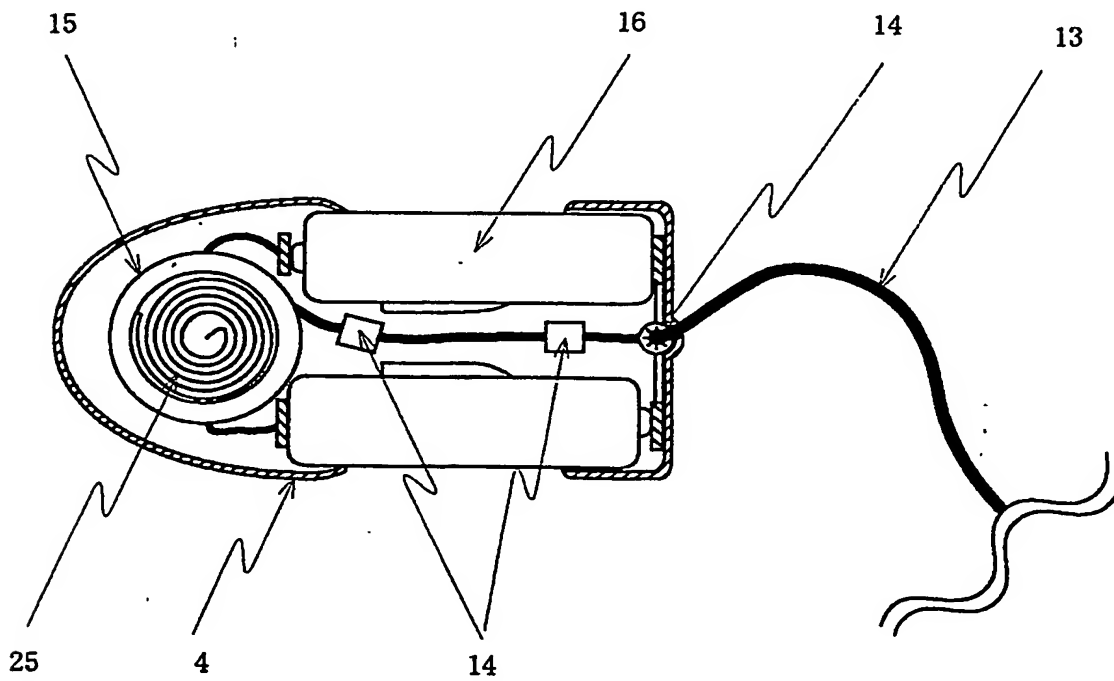
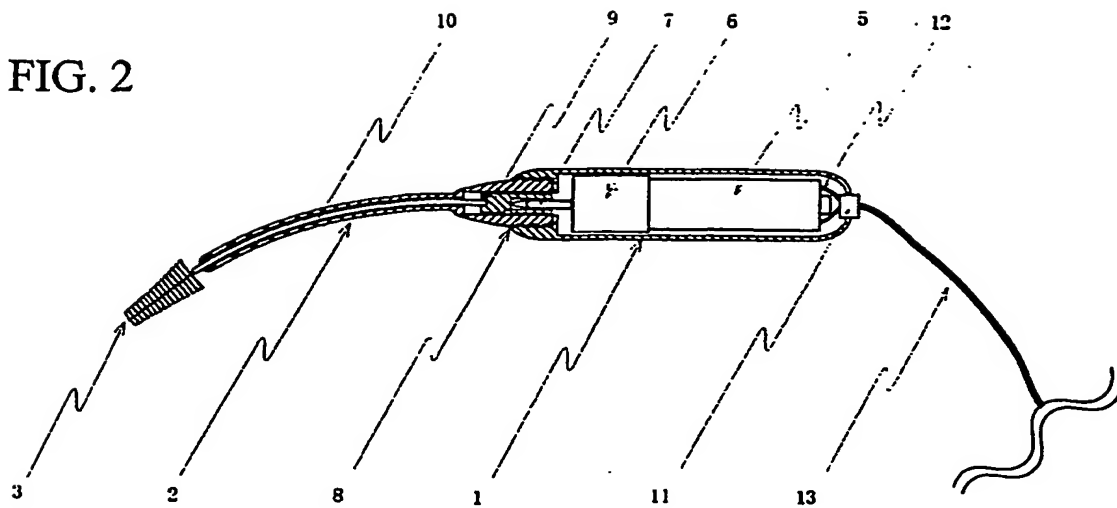


FIG. 3

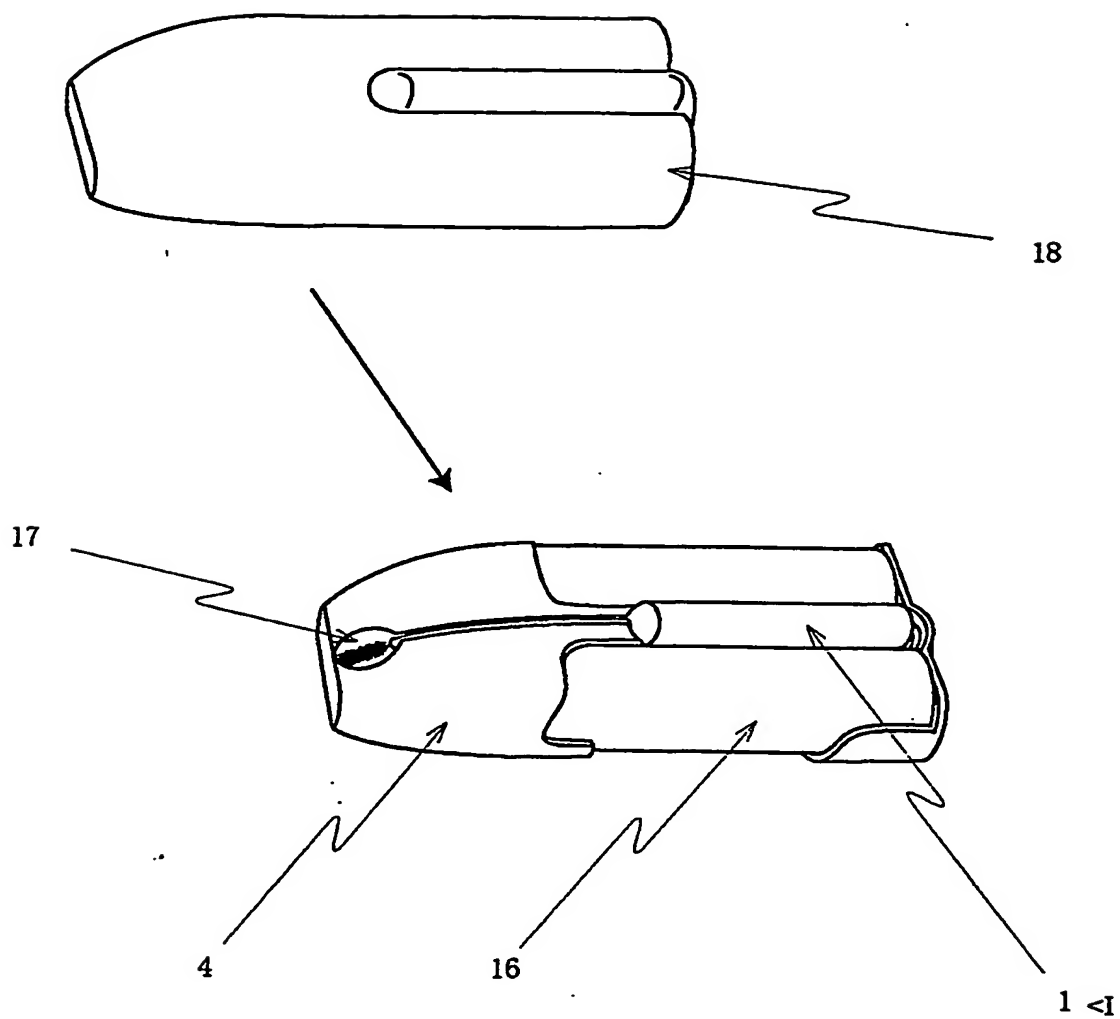


FIG. 4

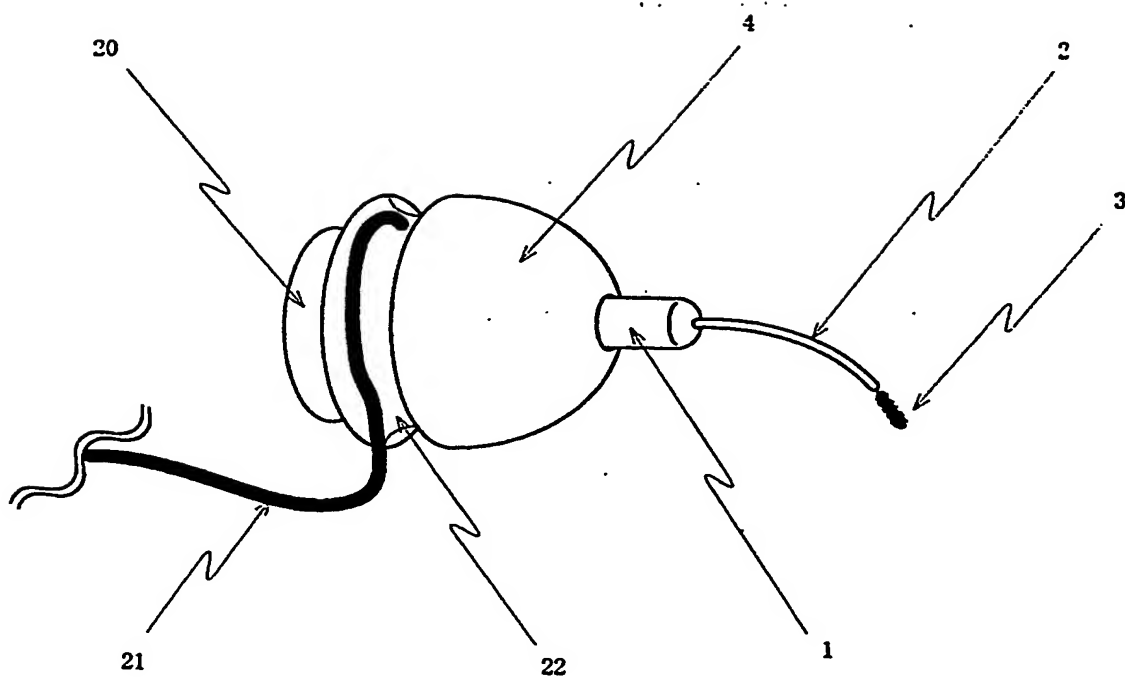


FIG. 5

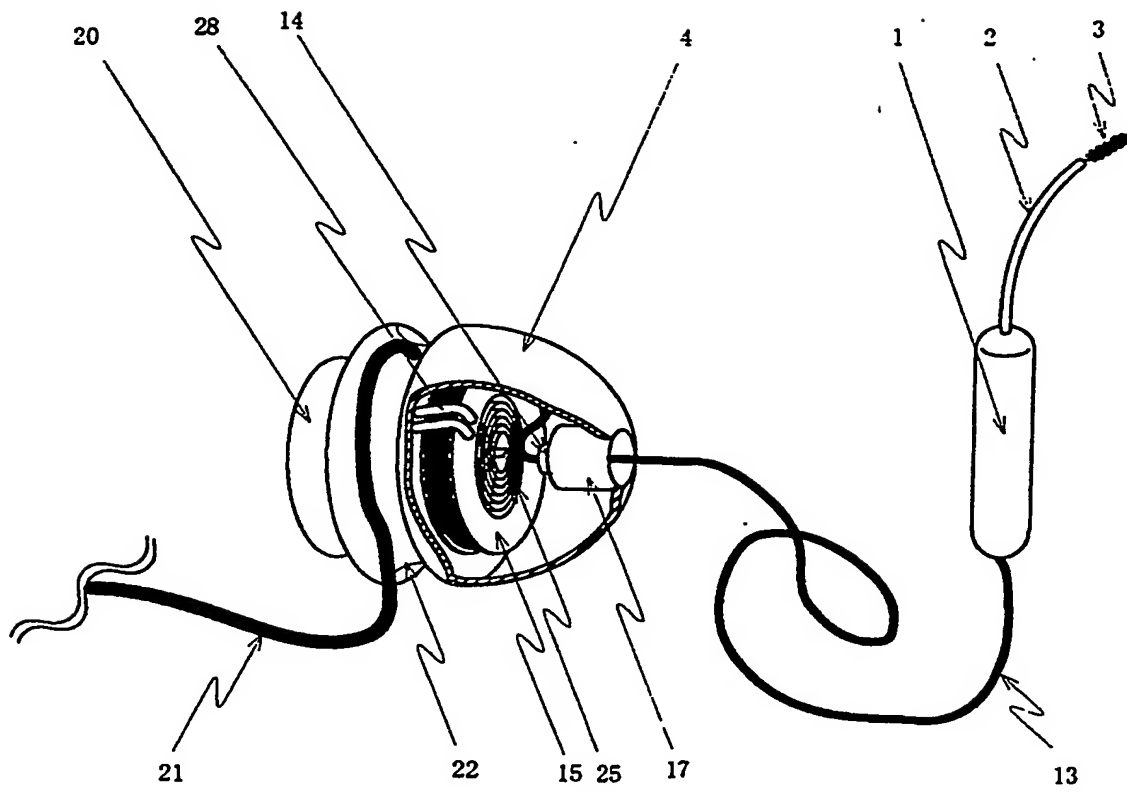


FIG. 6

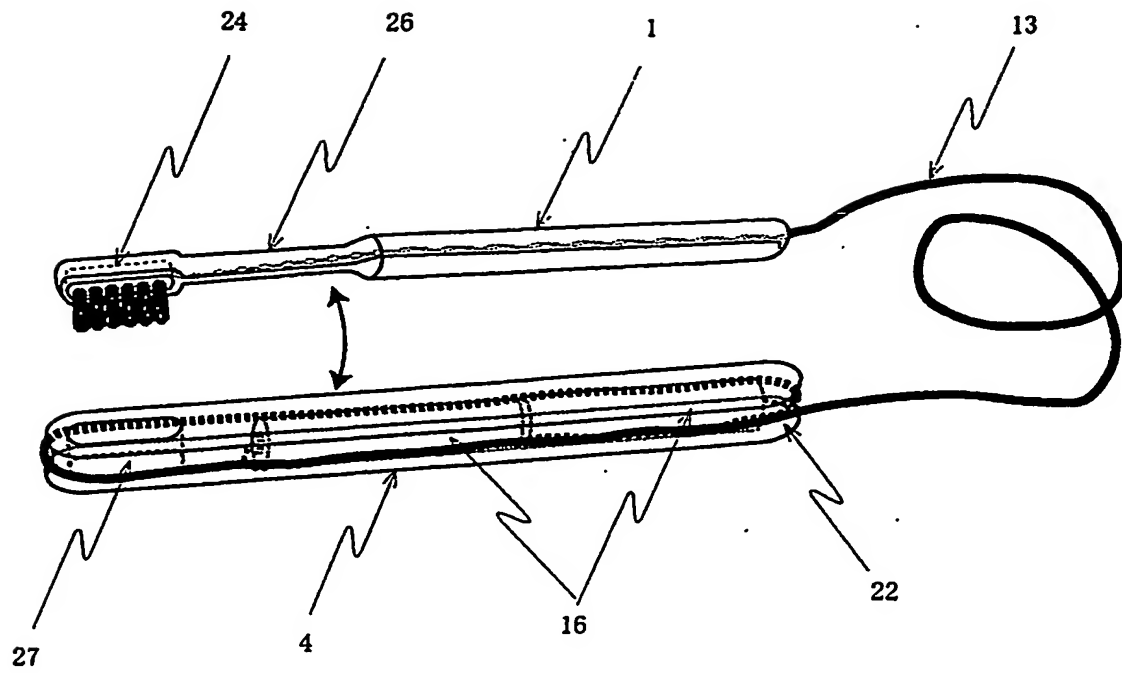


FIG. 7



FIG. 8

FIG. 9 (A)

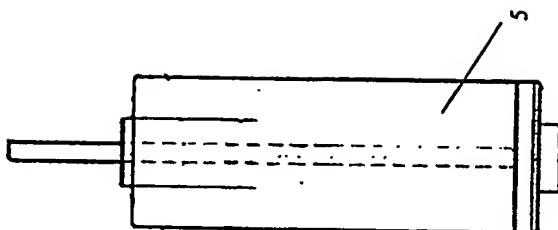


FIG. 9 (C)

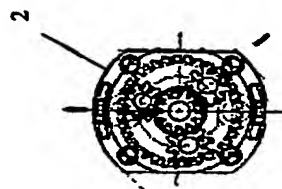


FIG. 9 (B)

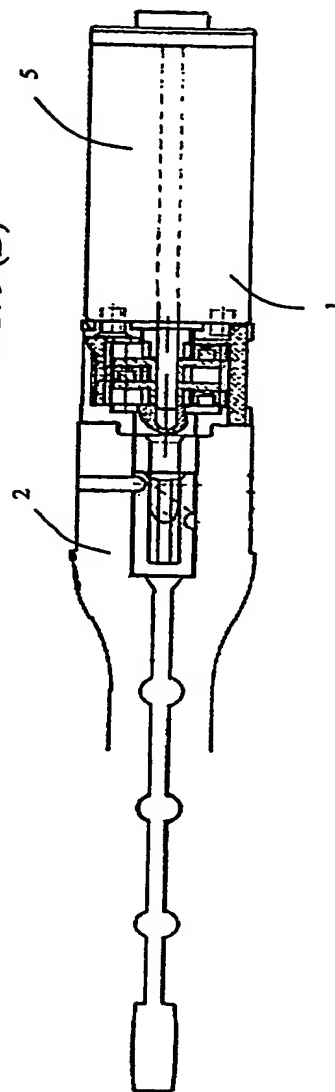


FIG. 10 (A)

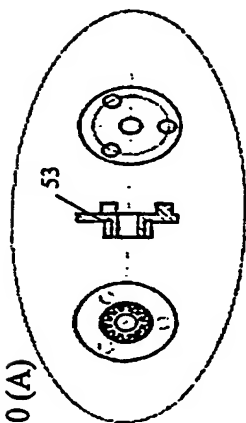


FIG. 10 (D)

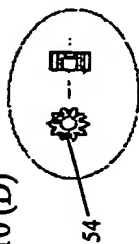


FIG. 10 (G)

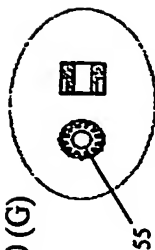


FIG. 10 (E)

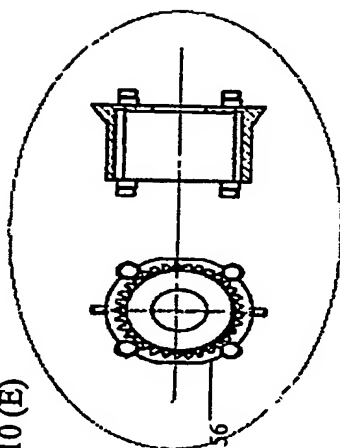


FIG. 10 (B)

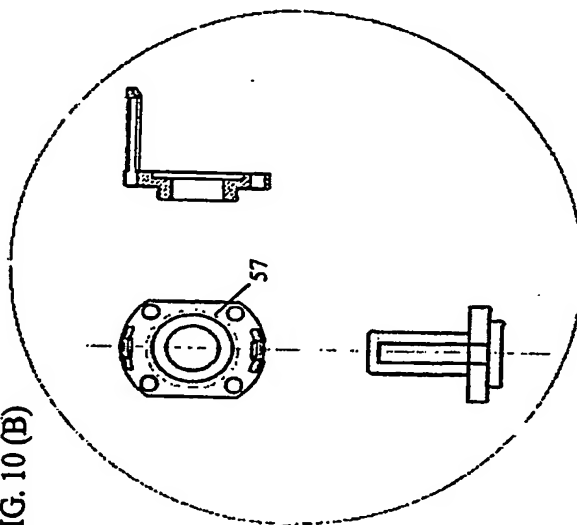


FIG. 10 (H)

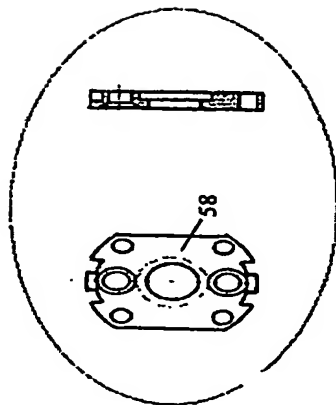


FIG. 10 (F)

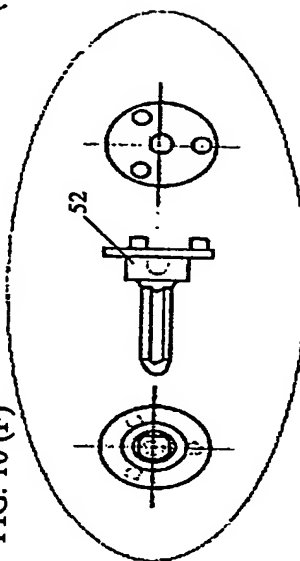
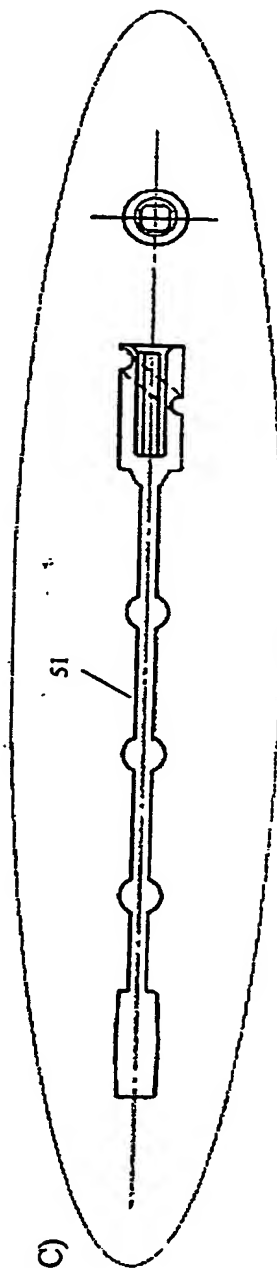


FIG. 10 (C)



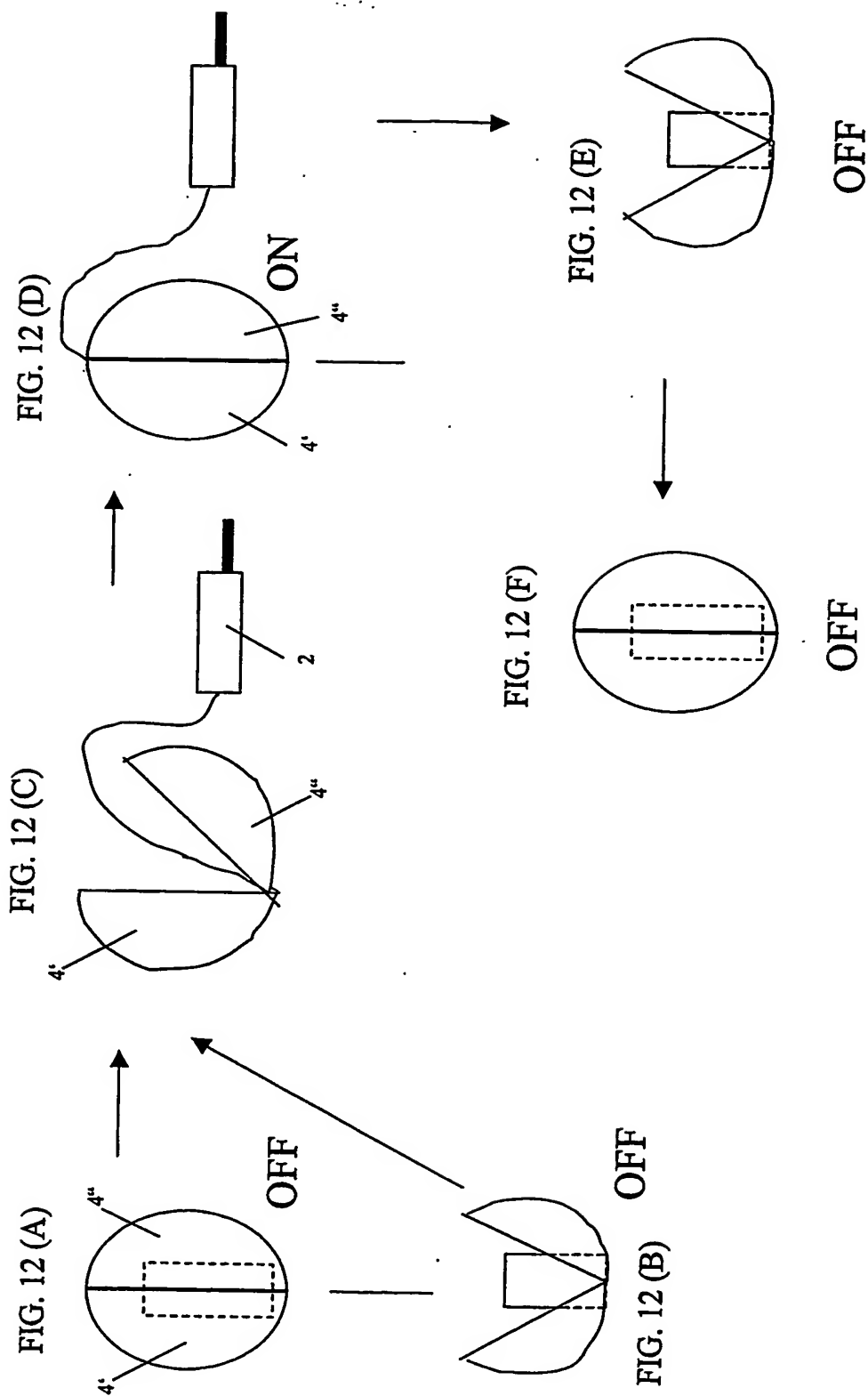


FIG. 13 (A)

Open

FIG. 13 (B)

Closed

FIG. 13 (C)

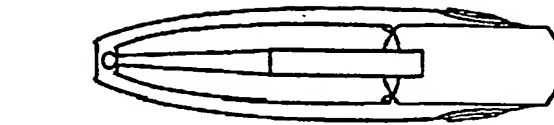
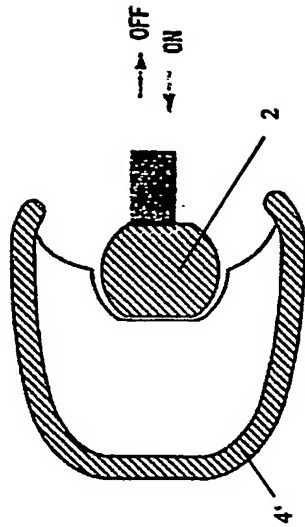


FIG. 13 (G)

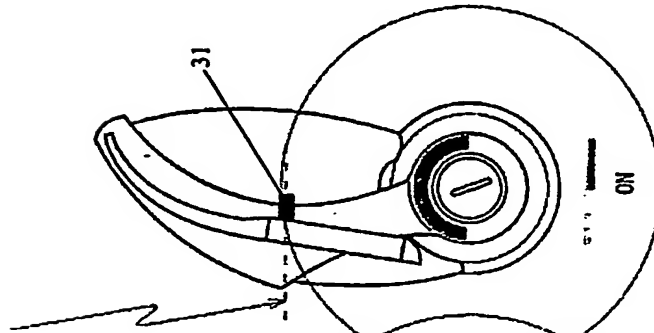


FIG. 13 (F)

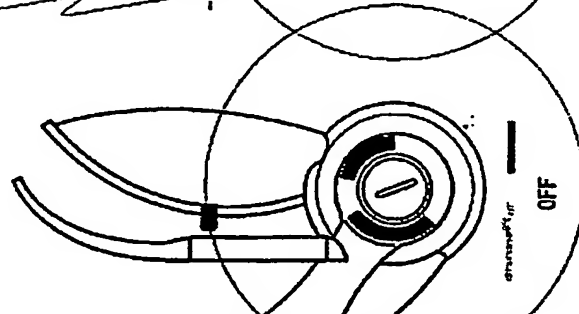


FIG. 13 (E)

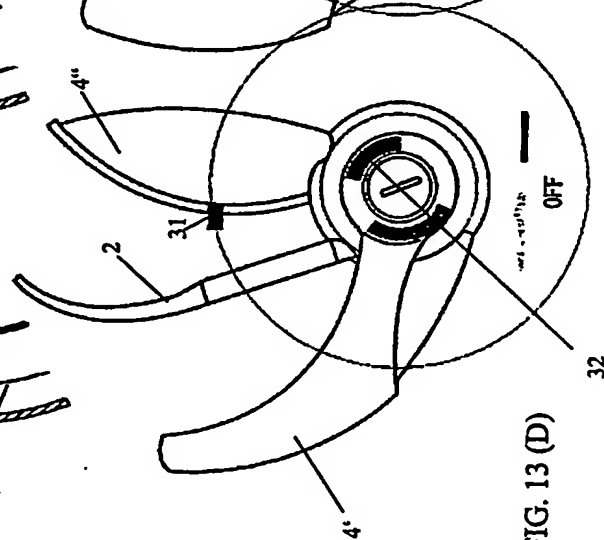


FIG. 13 (D)

INTERNATIONAL SEARCH REPORT

Intern. Application No

PCT/IB 03/03452

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A61C15/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A61C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 40 19 830 A (INOUE ATTACHMENT K K) 2 January 1992 (1992-01-02) the whole document	1,2,5,6, 9-11,18
A	WO 98 36703 A (WALKHOFF KLAUS) 27 August 1998 (1998-08-27) the whole document	1,2,5,6, 9-11,18

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *&* document member of the same patent family

Date of the actual completion of the international search

4 November 2003

Date of mailing of the international search report

11/11/2003

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2.
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Vanrunxt, J .

INTERNATIONAL SEARCH REPORT

International Application No

PCT/IB 03/03452

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
DE 4019830	A	02-01-1992	DE	4019830 A1	02-01-1992
WO 9836703	A	27-08-1998	WO	9836703 A1	27-08-1998